

## Book Reviews

*Introduction to the Blood-Brain Barrier. Methodology, Biology and Pathology.* Edited by WILLIAM M. PARDRIDGE. (Pp. xiv + 486; illustrated; £85 hardback; ISBN 0 521 581249.) Cambridge: Cambridge University Press. 1998.

The title of this volume belies its content. It is much more than an Introduction. It is virtually a current encyclopedia on the subject. The scope is comprehensive and well structured, the field being largely covered in no less than 50 chapters and 486 double-columned pages. The choice of contributors is good and the editor and publishers have cajoled them into producing chapters, not articles, of surprising comparability in style, presentation and format. Thus, the reader does not suffer the disjointed feeling caused by many multi-author texts. The quality of the chapters is generally very high and some constitute excellent contemporary reviews of the individual topics. Most have manageable lists of well chosen references.

The main thread is rightly the cerebral endothelium itself in all its manifestations in vivo and in vitro. The first part deals with methodology, the second with transport biology, the third with general aspects of CNS transport (e.g. cerebrospinal fluid, membranes, circumventricular organs and development), the fourth with signal transduction/biochemical aspects, and the fifth with 'pathophysiology in diseased states'. Despite this tautological title, the fifth part is of particular interest to all those concerned with the many neurological conditions in which the blood-barrier (BBB) is important. I have not seen such a good collection of accounts of the BBB involvement in cerebral amyloid angiopathy, multiple sclerosis, cerebral ischaemia, AIDS, hypertension, brain tumours, traumatic brain injury, cerebral malaria and bacterial meningitis. One learns such intriguing conclusions as that the choroid plexuses and ventricular CSF are the route for dissemination of bacteria from blood to subarachnoid space in meningitis, and that the barrier opening in AIDS may be systemic rather than local in origin. The chapter on multiple sclerosis by Brosnan and Claudio is quite excellent and leaves the reader with a coherent view of the role of cells and chemical mediators in the origin and development of the local permeability increase. It gives a good basis for the supposition that measures to tighten the BBB also reduce the severity of symptoms during relapses and may slow progression of the disease. Whilst several of the contributors refer to cerebral oedema in their chapters, it would have been useful to have had a separate chapter on this general and unpleasant manifestation of severe barrier breakdown.

The ethos of this book is partly explained in William Pardridge's introductory chapter, 'Blood-brain barrier methodology and biology'. He rightly stresses the approach to investigation of the BBB has to be multi-disciplinary, and the section on methodology covers with clarity and completeness the wide extension of methods from endothelial cell culture to brain imaging in humans with clarity and completeness. There follows in this introduction a curious scheme of 9 'dialectics' in blood-brain barrier research. The intent seems to be to demonstrate the overthrow by the editor of certain fallacious paradigms in current BBB research. All are dismissed with minimal evidence. Some of his arguments are trite and some represent his prejudices. Fortunately, the content of chapters in the book often puts the record straight, e.g. that P-glycoprotein

is sited primarily at the luminal membrane of the endothelium rather than in the astrocytic foot processes. Unfortunately, in relation to transferrin, the book does not contain any review of the overwhelming evidence from Morgan and others that iron must largely be released from transferrin during its transport through the BBB, because influx of the former from blood into brain is disproportionately greater than the very small influx of the latter. These are minor aberrations in detail that are surprising from one who has contributed so much to the subject; they apply primarily to a small section of the introduction and do not mitigate against the value of the majority of the content of this excellent book. It should play a major role in reversing the underdevelopment of research into and understanding of the BBB, these relative inferiorities also being emphasised in the Introduction. If the reader in the United Kingdom is deterred by the not unreasonable price of £85, please make use of your hard-won grant income, drop a hint to a wealthy relative or put pressure on your library to make available this volume and the invaluable information which it contains.

M. W. B. BRADBURY

*Forensic Osteology: Advances in the Identification of Human Remains.* Edited by KATHLEEN J. REICHS. (Pp. xiii + 567; illustrated; ISBN 0 398 06804 6.) Springfield, Illinois: C. C. Thomas. 1998.

Twelve years have passed since the publication of the first edition of this text. In that time, the advances in forensic anthropology have been many and I believe that this second edition aims to chart some of these developments. Perhaps this expansion of knowledge is reflected in the increase from 16 to 25 chapters and the virtual doubling in size of the book. I wonder then what conclusion may be drawn from the fact that, apart from the editor, only 5 authors pass from the first to the second edition and the same authors have updated only 3 of the original chapters!

The book is separated into 8 sections covering topics such as recovery, time since death, the biological profile, trauma, statistics and specialised techniques. Whilst the first edition covered most of the basic information of the time, there is no doubting that the second edition is a far more scholarly text which places a much greater emphasis on the truly forensic, rather than the archaeological, aspects of the subject. However, it does suffer from the inevitable 'multiple contributor' syndrome. Whilst many of the chapters are exceptionally well written and informative and serve not only to highlight new advances but also to summarise past achievements, there are some contributions that do not quite achieve this standard. Some subjects are dealt with very superficially whilst others recount in minute detail the results of what is clearly a research project.

Although the title refers to forensic osteology, it is clear from the list of contents that the topic covered is in fact forensic anthropology. Although it may seem a small point the former is a relatively small area of expertise whereas the latter covers a vast array of disciplines and so the omission of certain critical areas is somewhat perplexing. Forensic anthropologists are working hard to forge cooperative investigations with archaeologists and I would have liked to see more information on the advances in the detection of remains, in addition to the chapter on cadaver dogs.

Probably the most important advance in forensic anthropology within the last 15 years is the role that genetics can now play in the identification process. Although this is indeed a vast subject, I feel that it could have been covered in at least a summary format so that readers who may be unfamiliar with the techniques may at least make some foray into this subject. Whilst the advances in stature estimation have perhaps been few, I do feel that to make the biological profile complete then an overview of the subject should have been included. In many countries, the forensic anthropologist works alone and has to be the 'jack of many trades' and for that reason I also think that the omission of details on the advances in dental anthropology is to be regretted.

I am not entirely clear who the text is aimed at. If at students, then I think it is too detailed in some areas and lacking in others whilst if it is aimed at the professional forensic osteologist then I do believe it would benefit from the addition of some of the suggested information. On balance, however, this is a useful text for the experienced forensic practitioner and should certainly be available in all libraries for consultation. I hope that when the third edition appears, all chapters will make it up to the high standard offered by some of the contributors and that other areas of expertise may be included. I am in no doubt that this text will then become an indispensable aid to every forensic anthropologist.

SUE BLACK

*Georges Cuvier, Fossil Bones and Geological Catastrophes.* By MARTIN J. S. RUDWICK. (Pp. xvi + 301; illustrated; £27.95/\$34.95 hardback; ISBN 0 226 73106 5.) Chicago: University of Chicago Press.

The British are fortunate that Charles Darwin's contribution to biology was so profound that even the most jingoistic presentations of the history of biology are in little danger of exaggerating his importance and influence. He would be the 'good guy' in any account of the history of ideas about evolution and natural selection. There is also, at least in English-language accounts, little disagreement about the identity of the 'bad guys'. This dubious distinction is almost always accorded to 2 prominent French natural historians, Jean-Baptiste de Lamarck and Georges Cuvier.

Lamarck, the senior of the 2 by 25 years, was an erstwhile botanist who later turned his attention to invertebrates. When the Museum National d'Histoire Naturelle was formed by merging the Royal Botanical Garden and Museum, Lamarck was the obvious candidate for the post of Professor of *insectes et vers* – insects and worms. Georges Cuvier was born in 1769, not in France, but in territory belonging to the duchy of Württemberg. However, when his birthplace, Montebéliard, was annexed by France during the Revolution, he became a Frenchman and went on to become one of France's most distinguished natural historians.

Cuvier spent all his professional life at the Muséum National d'Histoire Naturelle. He began in 1795 as a *suppléant*, assisting Mertrud, the Professor of Animal Anatomy. On Mertrud's death, in 1802, Cuvier succeeded to the Chair, but he insisted that it was redefined as a Chair of Comparative Anatomy. Whereas the Museum was the base for his research, his election, also in 1795, to the 'First Class' of the newly formed Institut National provided him with a forum for his public declarations about the history of life. He later became one of the 2 scientific secretaries of the

Institut, a post which brought him into contact with Napoleon Bonaparte and which was the foundation of his links with the national government. In 1800 Cuvier succeeded Daubenton as the Professor of Natural History at the Collège de France. This third appointment meant that Cuvier was in effect the doyen of vertebrate zoology in France. Beside these onerous appointments, Cuvier's involvement in administration—he served on several commissions to report on education in France—inevitably affected his ability to conduct research, and his own original contributions to natural history effectively ended in 1810.

In this book, Martin Rudwick, who is a distinguished scholar of palaeontology, explores the basis for Cuvier's status as the arch 'bad guy' of evolution by presenting new translations of the relevant publications, accompanied by perceptive commentaries. These do much to rehabilitate Cuvier's reputation, for they are based on what Cuvier wrote as opposed to the views others have attributed to him. The book also provides a healthy corrective to the Anglophone viewpoint that concludes that everything worthwhile in geology was discovered by Englishmen or Scotsmen.

The opprobrium meted out to Cuvier is largely due to the perception that his 'scientific' statements were no more than reiterations of the Genesis story of the origin of life. In fact, as Rudwick elegantly demonstrates, this misinterpretation of Cuvier's writings can be traced back to the not altogether accurate translations of his works that were the main means by which the Anglophone world learned about Cuvier's views on natural history. The translations were the work of Robert Jameson, the Professor of Natural History at Edinburgh, and were sufficiently widely read to merit 5 editions. Whatever the veracity of Jameson's translations, the reality is that most of his readers looked no further than Jameson's preface and editorial notes for information about Cuvier's scientific views, and it was the contents of these that sealed Cuvier's fate. In them Jameson maintained that the main purpose of the 'Preliminary Discourse', which formed the preface of Cuvier's *Recherches sur les ossements fossiles*, was to demonstrate and underline the authority of the Bible. In many ways nothing could be further from the truth, but it was by such misplaced and wrong-headed advocacy that Cuvier acquired the reputation of being an 'unreconstructed Creationist'.

In fact, Cuvier has a just claim to have been the first person to set out a scientific prospectus for vertebrate palaeontology. In the 'Preliminary Discourse' he promotes the idea that fossils are 'documents' that need to be 'read' and 'interpreted'. He comments that although he began his career as a comparative anatomist, he went on to become a 'new species of antiquarian', whose task was to 'burst the limits of time'. Rudwick suggests that it was Cuvier's work which 'fleshed out the metaphor that had become almost a cliché'. Cuvier actually did 'use fossils as the historian used documents, to piece together an authentic history of the earth, and of life at its surface'. Indeed, it would be difficult to write a better description of the scope and the practice of vertebrate palaeontology than the following statement by Cuvier. In a lecture to the Institut National he said that 'it was necessary to determine the genus and species of... each substantial fragment of bone, to assemble the bones belonging to the same species, to reconstruct in some way the skeletons of the animals; and then to compare the beings thus revived with those that naturalists have discovered alive on the surface of our present earth, to determine their similarities and their differences'.

We now take it for granted that palaeontologists can identify animals from meagre scraps of fossil bones and teeth. However, it was Cuvier who brought together

comparative anatomy and vertebrate palaeontology, and established the principle that small fragments of bones are in many cases sufficient evidence to enable a researcher to identify the animal. He wrote 'every organized being forms a whole.... None of its parts can change without the others'. This is as strong a statement about morphological integration as one could imagine. There are also indications that Cuvier understood that fossils could be used to reconstruct past environments.

What, then, were the origins of Cuvier's interpretation that evolution had proceeded by a series of 'catastrophes'? With the enormous benefit of hindsight it is apparent that this interpretation arose because he confused the fate of individuals with the fate of species. Today, we would describe this as confusion between 'microevolution' and 'macroevolution'. Cuvier was so impressed with the discoveries of whole animals trapped in ice that he interpreted this as evidence that whole floras and faunas were overtaken by marine incursions so sudden that they preserved what existed, rather like a life science tableaux. These incursions apparently did not necessarily cause all life to become extinct, but they were sufficiently 'terrible' in their nature to have played havoc with all but the most durable animal groups. Cuvier used his knowledge of geology to suggest that these catastrophes had all involved the sea, and that through time they had become 'steadily less deep and less general'. However, he did subscribe to the theory of the French geologist De Luc, that there had been a particularly 'great and sudden revolution' only a few thousand years ago which had radically modified the disposition of the continents and the oceans. It was in the wake of this event that Man evolved.

Rudwick's careful translations of Cuvier's texts make it quite clear that Cuvier derived his catastrophism from his interpretations of the fossil and geological records, and not from the biblical version of events. He was not alone in being in error but, thanks to Jameson, he seems to have borne the brunt of the inference that his interpretation was due to a literal interpretation of the Bible. In fact, Cuvier reviewed the records of a range of cultures and concluded that, as Rudwick puts it, that 'the textual records of all known cultures pointed to a relatively recent origin for human civilization in its present form, compatible with the physical evidence for a geologically recent 'grand revolution in nature'. This is slender evidence upon which to brand the writer as a 'biblical literalist'.

This is a fine work of scholarship that should help in the reevaluation of Cuvier's contributions to palaeontology. Cuvier was no Darwin, but he does not deserve to be represented as the antithesis of sound evolutionary science. Rudwick presents a balanced assessment of Cuvier that should replace, once and for all, Jameson's flawed interpretation of Cuvier's ideas about evolution and the history of life.

BERNARD WOOD

*The Complete Visible Human.* By H.-O. PEITGEN, W. BERGHORN and M. BIEL. (2 CD-ROMS; ISBN 0 387 14247 9.) New York: Springer.

These are 2 high resolution CD-ROM disks, one containing a complete man, the other a woman. They are based on the National Library of Medicine's Visible Human Project. They contain the entire anatomical cross-section of 'VisMan' (1878 sections) and 'VisWom' (5189 sections). For Windows computers, a minimum of 16 megabytes of RAM is required (Macintosh requires 24 megabytes minimum). Good monitor resolution is necessary. Each disk

is self-loading and presents a frontal view of the body on the left of the screen and a transverse section to the right of it. The line of the transverse section can be dragged up or down with the mouse and the appropriate transverse section is shown. The frontal view allows coronal slices to be viewed throughout the depth of the body. Navigation through the sections is very easy. Slices can be selected easily, decompressed, viewed and saved on disk. A stack of cross-sections can be selected to include a complete structure. It is possible to alter the size and appearance of the images, so that magnified views of small or complicated structures can be obtained.

I tried the disks on 3 computers with various monitors, including the minimum recommended, of 800 × 600 pixels and 256 colours. The resolution was disappointing and on all of them the brown colour appeared rather unnatural, although it was possible to distinguish different structures.

The disks would be valuable for someone with an already intimate knowledge of anatomy who wished to review the anatomy of a complex area. In clinical practice they would be particularly valuable for radiologists working with imaging scanners that produce cross sections such as computerised axial tomography and nuclear magnetic resonance imaging. For surgeons planning novel methods of approaching structures the sections would enable overlying tissues to be identified and plans developed to avoid important ones.

As a teaching aid the disks have limited appeal, since the anatomical structures are not annotated. Perhaps in future the publishers will be able to provide alongside the sections interreactive tests and answers for self testing.

R. M. KIRK

*Cortex: Statistics and Geometry of Neuronal Connectivity*, 2nd edn. By V. BRAITENBERG and A. SCHÜZ. (Pp. xiii + 249; 90 figures; ISBN 3 540 63816 4). Berlin: Springer. 1998.

Valentino Braitenberg has for long represented a part of the scientific community that, for some, is interesting and iconoclastic and, for others, downright disturbing. Whatever one's position over the years, there is little doubt that his publications are of the highest quality (including quantitative quality!) and punctiliousness (in the noblest sense of the term). To talk to him generally gives the impression of his insisting on getting the 'mot juste' (and the right number to boot).

That is why 2 of his monographs have always impressed me by their erudition and attention to detail. Soon after its publication in 1973, he gave me a copy of his *Gehirngespinnste*, an attempt to quantify the brain in a functional and entertaining way. I found it totally absorbing. I just had to refer to it every time I wanted to know how far into space the axons of a human brain would stretch if put end to end! That is a caricatural image of the wealth of information in that book. Its publication in German prevented it becoming better known, but in 1977 I received another copy, this time in English as *On the Texture of Brains*. These works were much influenced by Valentino's preoccupation with the fly's brain at that time, but the makings of a true mammalian neuroanatomist were there, with references to the guinea pig, the mouse and to man.

Then in 1991 came the first edition of his book with Almut Schüz *Anatomy of the Cortex—Statistics and Geometry*, of which the volume under review here is the brand new second edition.

This book views the cerebral cortex from what the authors call 'an unusual angle'. They try to explain its

structure from its function, as well as vice versa. They point out that the cortex, of necessity from its structure, is a 'mixing device'. Areal differences belong to the realm of keeping different sorts of information separate. Cortical 'wiring' is of less importance than considered by most people.

As they get into the task of supporting these ideas, the authors provide fascinating and easy-to-read accounts of such things as 'Where is the cortex?'. Straightaway we encounter the lucidity of the textual flow, and of the photographs and drawings. The authors give no quarter, however, in insisting on a strict statistical and geometrical approach to the cortex. No neuroanatomist should ever again make mistakes about how to calculate neuronal and synaptic density. There are beautiful accounts and illustrations of the interaction of dendrites, their spines and axons.

It may be considered that a review of the Golgi architecture of neuronal types in the cortex smacks a bit of 19th century Germany. But then, when one looks more closely, this ancient technique has perhaps helped us understand the cortex more than any other single method, and still continues to do so.

We are led through concepts of the development of cortical microconnections, in terms of ontogeny, memory and 'In search of engrams'. Cortical maps, cortical layers—do they exist? What are they for? All these mysteries are laid bare here.

As we come towards the end of the book we are introduced to specific cortical functions, to see how they might fit the authors' concepts. Feature detection, visual orientation columns, and even language, find their place.

Overall, this is a scholarly book. It is easy to read, but cannot be scanned through rapidly. The factual content is dense. There are no revolutionary ideas (Braitenberg's revolutionary ideas of 20 years ago are now mostly considered to be classic truths!) This is not a book that the reviewer insists should be 'on everybody's bookshelf', but those who do acquire it will certainly use it over and over, just as I have used my 1970s vintage Braitenberg texts over the years.

LAURENCE GAREY

*Unbiased Stereology: Three-Dimensional Measurement in Microscopy.* By C. V. HOWARD and M. G. REID. (Pp. xviii + 246; illustrated; £19.95 paperback; ISBN 1 85996 071 5.) Oxford: BIOS. 1998.

Scientists are increasingly interested in obtaining quantitative information about the geometry of an object; anatomists and physiologists often seek correlations between structure and function, whereas material scientists may want to correlate structural parameters with physical properties. Quantification, however, induces a degree of responsibility not all scientists may be aware of. More than proper measuring, proper inference requires proper sampling, and stereology is the science that dictates the rules for proper sampling in a geometric setting.

The rules for proper sampling are surprisingly few, but the details of their application to a particular object vary as much as the objects themselves in biology and materials sciences. As a consequence, a book on stereological recipes is unlikely to prosper, whereas a reasonable book on stereological principles sounds a much better idea: and fortunately the book under review falls mainly in the latter class, without ignoring important practical details.

In design stereology, the object of interest is bounded and nonrandom (for instance a biological organ), and therefore proper sampling is necessary to obtain unbiased information. In model stereology, however, the object may be regarded as a small part, with no natural boundaries, of a homogeneous 'whole' (for instance a small block of a rock, or of an alloy) which is modelled by a random spatial process; here the position of the sections is not critical, but their orientation may be if the structure is anisotropic. The book concentrates on design stereology, but the basic stereological equations are common to both approaches; only the sampling criteria change.

The book is structured into 11 chapters (185 pages), 4 appendixes (44 pages), a list of references (8 pages) and an index (8 pages). There is also a 2 page list of abbreviations, and another 12 pages devoted to the contents, preface, foreword, and a dedication to Susana Maria G. Antunes, young stereologist, dear friend and colleague, who died tragically at the time the book was nearly in the press.

The first 2 chapters are important in length (38 pages) and scope; here is in fact where main characters that tend to daunt nonmathematicians are brought to the stage in a simple and attractive manner: uniform random sampling, systematic sampling, bias and unbiasedness versus precision, uniform randomness and isotropy, etc. Such ideas are prerequisites for good science in general, with or without stereology. The reader is also warned about the dangers inherent in the use of ratios, as opposed to global quantities, especially in biology. The next 8 chapters cover the estimation of the classical stereological parameters, namely volume, particle number (based on the disector and fractionator ideas), surface area, and feature length. Chapter 9 is devoted to unbiased particle sizing in a modern perspective, namely with no assumptions about particle shape. It is noteworthy that the huge amount of literature, spanning over 6 decades, devoted to the problem of sizing particles assuming that they are spheres, from measurements solely on planar sections, is completely ignored. This was probably a good idea because the book is basically addressed to beginners who never heard 'how to do it wrong'; more 'senior' stereologists may, however, miss half a page about the history of 'assumption-based stereology' (not to be confused with model stereology). Chapter 10 (26 pages), is devoted to pertinent statistics, notably ratios, 2-stage sampling design, etc. Finally, Chapter 11 (10 pages), is a useful tailor's drawer summarising the recent development of stereology, and further concepts such as vertical section and slice designs, connectivity, single object, and second-order stereology. The text flows easily and is supported by many and excellent figures. A very important feature is the inclusion of 17 practical exercises. The reader is expected to work the exercises out, collecting the raw data him/herself with the aid of a good collection of grids or 'test systems' provided in Appendix B; full answers are given in Appendix C. Appendix A describes a few simple gadgets and instruments, and Appendix D gives useful addresses.

Applied mathematicians, statisticians and numerate scientists wanting to know more than the basic ideas and tools—namely proofs, further techniques such as membrane thickness unfolding from sections, estimation of connectivity, local and second-order stereology, etc.—will have to resort, for the time being, to some of the well chosen references. Particle sizing is also a rather extensive topic which can hardly be treated in such detail in 12 pages. These prices are however easy to pay if the result is a handy and very agile paperback containing the essential information.

Specialists may find small inaccuracies, but these are very few and of little practical importance. For instance, sectioning in Fig. 7.4(b), (c) would be more correct with a set

of systematic planes (much in the spirit of Fig. 6.5(b)); sectioning with single probes has a few subtle problems. Also, the disector formula in Fig. 5.12 could easily be adapted for say  $p$  test points per frame, by replacing  $a/f$  with  $a/p$ . Specialists may also not find much excitement along the text, but the book is not a research monograph. However, people who teach stereology at any level will find excellent inspiration from the way many basic concepts are explained in the book—I liked for instance the idea of Figs 2.1 and 6.3, and many others.

The authors acknowledge the inspiration for many of the didactic tricks and exercises given in the book from the

teaching squad at the international stereology courses, given annually under the auspices of the International Society for Stereology (ISS) since 1975. Participants at these courses contributed to shape modern stereology over the years. To collect the basic ideas and tools in less than 250 pages, thus making a textbook ready to be handed without hesitation to the fresh technician, student, or scientific collaborator entering the laboratory for the first time, is a far from easy task for which the authors must be thanked, and congratulated.

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